

2001-2002 Funded Centers

ACOUSTIC COOLING

CENTER

The Center for Acoustic Cooling Technologies has been established for the development of high frequency thermoacoustic engines for cooling applications. The Center is based on two thermoacoustic principles. The first principle is that heat can generate sound, the second is that sound can be used to pump heat. An important application for the above devices is in the heat management of computers, lap-tops, and microcircuits.

ACCOMPLISHMENTS

The Center for Acoustic Cooling is structured on fundamental developments of miniature thermo-acoustic devices supported by the Office of Naval Research, the interfacing of devices to microcircuits and computers as supported by DARPA (HERETIC Program), and industrial collaboration with a local company, for the development and commercialization of Center technologies. Prototype devices have been constructed and successfully demonstrated by an independent company.

UNIVERSITY OF UTAH

Can you imagine.....

A miniature cooling device that replaces fans in airplane cockpit displays and personal computers using sound as the main energy source and measuring from 4 cm to less than 1 cm?



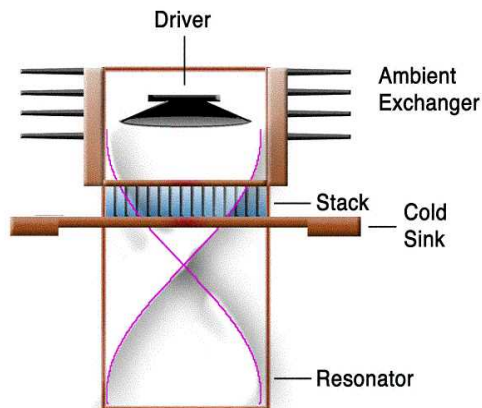
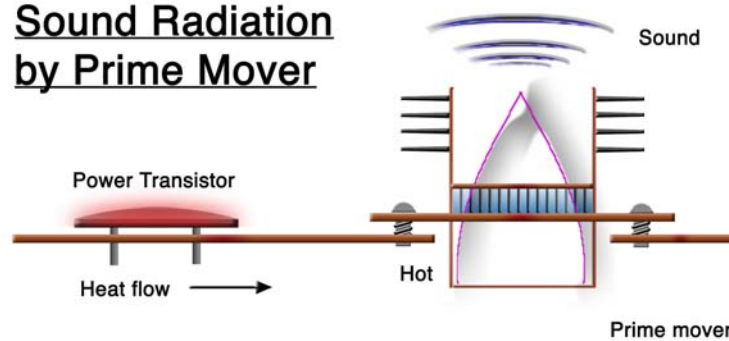
TECHNOLOGY

The Center's technology is based on two effects in thermo acoustics. The first is that heat can be converted into sound energy; and second, that sound can pump heat. Both have been developed into devices with dimensions ranging from 4 cm to 0.8 cm, with the possibility for further miniaturization and microcircuit integration.

ACOUSTIC COOLING

Figures below show the basic units for circuit applications: spot-cooling of heat pumping, and heat removal by acoustic radiation and energy conversion to electricity.

Sound Radiation by Prime Mover



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ADVANCED JOINING OF MATERIALS

CENTER

The Center for Advanced Joining of Materials (CAJM) is developing enhancements and new technologies based on friction stir welding (FSW). FSW is a relatively new, innovative joining technology that is revolutionizing the way in which aluminum and copper materials are being joined. The objectives are to develop enhancements to this existing technology that will broaden the use of this process in new materials and applications, and to transfer these technologies to local, national and international companies.

ACCOMPLISHMENTS

All of the third-year milestones have been met. To date, the Center has submitted five provisional patents. Of these, BYU has issued an exclusive license for the patent on super abrasive tools to a local Utah company. Co-development and marketing of these tools are continuing. BYU is presently seeking a partner for co-development on the FSW of polymeric materials. The center is currently pursuing another licensee and co-development partner, and anticipates this to be finalized during year four of funding. The Direct Machine and Controls patent was transitioned into its own Center for fiscal year 2002-2003.

BRIGHAM YOUNG UNIVERSITY

Can you imagine.....

A new method for welding metals and plastics that does not melt the material, does not add new material, and forms a joint that is base metal strong and virtually undetectable from the surrounding material?



TECHNOLOGY

The Center is currently focused on the development and marketing of three technological aspects of FSW: 1) tooling that will last longer, offer the ability to join a wider range of advanced materials, and enable better control of the resulting quality of the weld and its properties; 2) new control systems and hardware for large scale, three-dimensional FSW capabilities; and 3) new methods and novel tooling for joining polymeric materials.

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ADVANCED STRUCTURAL COMPOSITES

CENTER

The objective of the Center for Advanced Structural Composites is to develop the commercial potential of the IsoTruss technology. The IsoTruss enables the creation of super lightweight grid structures with the potential for revolutionizing industries as diverse as civil infrastructure (e.g., communication and construction), aerospace, automotive, marine and sporting structures and virtually any application area requiring high strength, high stiffness, light weight and superb corrosion resistance.

TECHNOLOGY

The core technology consists of an ultra-lightweight composite structural shape known as the IsoTruss. The IsoTruss is a novel, patented, three-dimensional structural form that takes advantage of the highly directional properties of high strength composites to produce an extremely efficient and lightweight structure. The IsoTruss incorporates stable geometric configurations with helical members that spiral in opposing directions around a central cavity, coupled with longitudinal members that pass through the intersections.



BRIGHAM YOUNG UNIVERSITY

Can you imagine.....

A power line transmission tower that can withstand extreme wind conditions, support tremendously heavy loads, remain corrosion free, be unaffected by temperature extremes, and weighs significantly less than conventional steel towers?



ACCOMPLISHMENTS

Several companies are currently negotiating licensing agreements with BYU for the IsoTruss technology, and a new Utah firm has licensed the rights for domestic commercial applications. As the core technology matures, additional discoveries, applications, and developments will provide ever increasing requirements for research and opportunities for funding.

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AGRICULTURAL BYPRODUCTS (PROFITABLE USES OF)

CENTER

The Center for Profitable Uses of Agricultural Byproducts was established to strengthen the economy of Utah, particularly the rural economy, by working closely with farmers, ranchers and other agricultural related businesses to transfer technologies utilizing agricultural production and processing byproducts. Byproducts of no or little value are transformed into energy and other salable items using technology developed at the center.

ACCOMPLISHMENTS

A fully operational system has been built at the Caine Dairy at Utah State University and is open for visits to see the system functioning, creating a showcase of this technology. Biogas can be seen burning at this site to produce hot water. A new, larger system is soon to come on line at the Ballard pig farm in Benson, UT. This new system is designed to produce enough electricity for 65 homes while treating pig manure. The system will be housed in an attractive metal building. This system is scheduled to be fully operational in early spring, 2003. The IBR technology is very unique and easy to manage, with a high treatment rate and reliability. The Ballard system

UTAH STATE UNIVERSITY

Can you imagine.....

A technology utilizing agricultural byproducts of little or no value and transforming these byproducts into a profitable business?



will be controlled using a touch screen computer. This Center has partnered with HEE, a new Utah company, to provide engineering design. Another new Utah company is being formed to build the systems.

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AGRICULTURAL BYPRODUCTS (PROFITABLE USES OF)

UTAH STATE UNIVERSITY

TECHNOLOGY

The technology developed at Utah State University for the profitable use of food production and processing byproducts is manifested in two major areas: 1) anaerobic systems that can produce energy (biogas) and soil amendment from manure and food processing waste, and 2) components of a high rate aerobic bioreactor (drum composter based) system that make the process more cost effective, and the products produced by the process more valuable.

Placement and painting of tanks for the IBR system at Ballard farm, Benson, UT



BIOMEDICAL OPTICS

CENTER

The goal of the Center for Biomedical Optics is to commercialize optical technologies for diagnostic, therapeutic and disease risk assessment in medicine. Recent advances in novel light sources, laser materials and laser spectroscopy make these optical techniques highly attractive for novel, non-invasive assessment.

TECHNOLOGY

The Center's technologies include Resonant Raman Scattering detection of carotenoid antioxidants in human tissue and a novel light source for biomedical spectroscopy.

ACCOMPLISHMENTS

Nutriscan, Inc. was formed during the second year of COEP funding and negotiated a license for our US Patent No. 6,205,354B1: Method and Apparatus for Noninvasive Measurement of Carotenoids and Related Chemical Substances in Biological Tissue. This patent was issued March 20, 2001 for technology supported by earlier COEP funding. In September, Raman detection technology was licensed to Cardoderm, Inc.

UNIVERSITY OF UTAH

Can you imagine.....

A non-invasive optical laser technique that can detect and treat cancerous cells in the skin or mucosal tissue??



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BIOREMEDIATION

CENTER

The Center for Bioremediation develops, refines, and implements innovative biotechnologies for the removal of heavy metal and other inorganic contaminants. The Center's technology focus is biological selenium removal. Additional technologies include technologies for arsenic removal and cyanide degradation with a current emphasis on enzymatic cyanide degradation.

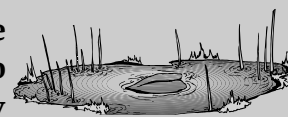
TECHNOLOGY

The Center's field-proven biotechnologies include Selenium reduction, Arsenic Reduction and Cyanide Biooxidation Technology. Selenium Reduction technology is capable of economically removing this contaminant from wastewaters to below detection levels. The Center's selenium technology is based on a novel implementation path requiring a front-end analysis, specially adapted naturally occurring microorganisms, and patented and proprietary process configurations. This path provides unique bioremediation technologies that are more economical, faster, and more durable than other bioremediation technologies. The Arsenic Reduction Technology is based on selected and specially adapted naturally occurring microorganisms, and patented and proprietary process configurations.

WEBER STATE UNIVERSITY

Can you imagine.....

A faster and more economical way to remove heavy metals, such as arsenic or cyanide, from wastewaters to a point below detection, with naturally occurring microorganisms?



The Cyanide Biooxidation technology is based on selected and specially adapted naturally occurring microorganisms and patented and proprietary process configurations and developing enzymatic technology

ACCOMPLISHMENTS

The Center's technology has been demonstrated to be approximately 1/10 the cost of EPA's past BDAT and removes selenium to lower levels. Applied Biosciences is a successful spin out company.

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CELL SIGNALING

CENTER

Cell signaling consists of the set of biochemical interactions that mediate physiological changes within and between living cells. When a ligand binds to a receptor, for example, the interaction causes a biochemical response within the cell. Many diseases are associated with signaling pathways that have gone awry -- cancer, allergy, asthma, and acute inflammation are all examples of cellular responses unchecked by normally self-regulating pathways. The absence of a single protein or lipid can result in the disruption of a pathway that may be crucial for cellular function. The CCS Faculty seeks to understand these fundamental signaling pathways. By identifying technologies to manipulate the signaling processes, highly selective pharmaceutical agents can be developed to treat cancer, diabetes, and cardiovascular disease.

UNIVERSITY OF UTAH**ACCOMPLISHMENTS**

Echelon Biosciences, Inc., initially started in 1997 as Echelon Research Laboratories as the first spin-off company from CCS, has grown to 30 employees, has received a total of nineteen Phase I and Phase II SBIR awards, and surpassed the \$1 M sales mark in 2002. With the recruitment of former Iomed executive W. Tim Miller as its president and its expansion to new space in Spring 2003, Echelon is positioned to become a premier, home-grown biotechnology company. Locally, Echelon and CCS have met with the governor's technology development officials to foster the growth of a Wasatch front biotech cluster. Echelon was awarded the Tibbetts' Award for Small Businesses again in 2002, following its first award in 1999. Echelon has established a cancer drug discovery alliance with ComGenex, a Hungarian company, a product distribution agreement with Molecular Probes, Inc. in Eugene, OR. Its discovery of signal transduction inhibitors has generated interest in alliances or investments by a dozen major pharmaceutical companies and other potential investors.

CELL SIGNALING

TECHNOLOGY

Five core faculty and fifteen faculty associates bring extensive, complementary research expertise to focus on understanding the molecular mechanisms by which cells communicate, both under normal conditions and in disease states. The interdisciplinary collaborations among the faculty have produced unique insights into the molecular basis of disease. Understanding these biomolecular interactions can lead to the development of new drugs that enhance or interfere with cell signaling by small molecules. New technology from CCS has also been developed and licensed by Echelon to create a molecular sensor for directly monitoring heparin levels in blood. A microbiological assay platform invented by Dr. C. D. Poulter for identification of selective anti-anthrax agents was also optioned by Echelon. The discovery in 2002 of a natural ligand for the nuclear protein target of the \$3 B/yr diabetes drug rosiglitazone emerged from collaboration by Drs. McIntyre, Prestwich, and Zimmerman.

UNIVERSITY OF UTAH

Can you imagine.....

A new class of anti-cancer drugs that correct a molecular defect that can be diagnosed very early, while the cancer can still be cured?



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COMPLIANT MECHANISMS

CENTER

The objective of Compliant Mechanisms is to accelerate and streamline the development and commercialization process of compliant mechanisms, so that they may be quickly licensed to existing or new companies. The use of innovative and patented compliant mechanisms will give existing companies a clear competitive advantage, and will provide a unique and valuable product for new companies. The potential market applications and opportunities are immense.

ACCOMPLISHMENTS

Some examples of compliant mechanisms that have been designed and tested are: fishing reel, bicycle freewheel, derailleur and brakes, pull start for small gasoline engines, centrifugal clutches, string trimmer, small garden tiller clutch, go-cart clutch, continuously variable transmissions (CVT), general purpose belt drive CVT, second generation bicycle CVT prototype, bistable mechanisms, compliant parallel motion mechanisms, constant-force mechanisms, electrical contacts for PDA docking stations, fully compliant bistable micro mechanism, thermal actuators, linear motion micro-bistable mechanism and two position latching mechanism.

BRIGHAM YOUNG UNIVERSITY

Can you imagine.....



A method for redesigning any complex machine part to significantly reduce the number of parts, simplify the manufacturing process, reduce costs and end up with a more reliable and wear-resistant device?



TECHNOLOGY

The Center possesses methods for the design of compliant mechanisms that have reduced part count, reduced cost, and increased precision compared to conventional mechanisms. A number of specific classes of mechanisms have been investigated and developed for commercialization.

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(CROMDI) REPRESENTATION OF MULTI-DIMENSIONAL INFORMATION

CENTER

The Center for the Representation of Multi-Dimensional Information (CROMDI) was established to commercialize a new audio-visualization technology (IntuInfo) that facilitates the rapid and accurate analysis of large quantities of real-time data. CROMDI is an interdisciplinary team dedicated to the innovative representation of information and comprised of experts in Architecture, Art, Communication, Computer Science, Engineering, Finance, Mathematics, Medicine, Music, and Psychology. These diverse experts participate with their own unique perspectives and provide solutions to complex information design needs through a unique methodology and iterative process that has been refined over the years.

TECHNOLOGY

Information is intuitively presented with specifically designed audio-visual objects that exhibit changes in color, shape, size, sound, etc., driven by data variables and their relationships. IntuInfo can maximize information per screen space, integrate many variables, enable comparison to normative values, simultaneously display present and historical data and zoom to global or local contexts. Because of its intuitive features, IntuInfo enables the user to recognize, understand and act on events faster, more accurately, with less mental effort, and with less training than is possible using existing data visualization technologies. In fact, the state of the art in many fields is to represent information with plots, pie charts, graphs, icons, and matrices that need extensive training and have limitations to the display of large quantities of data.

UNIVERSITY OF UTAH

ACCOMPLISHMENTS

In the second year of funding CROMDI licensed the "cardiovascular display" to GE Medical Systems, formed a company called MedVis Inc. to commercialize the "drug display" and developed seven potential licensees. CROMDI received the First Place Award for "Best New Technology" from the Anesthesia Safety Association. Also, a NASA STTR grant was awarded to monitor the physiologic state of astronauts. CROMDI has received a DARPA seed grant to develop a pilot study and audio-visualization concepts for displaying the network status and resources to commanders. Also, a new audio-visual concept has been conceived (and is being patented) to support scheduling problems: this shall apply to both resource management and intelligence (detecting patterns of hackers, terrorists, etc.). A demo of financial displays was presented in New York City to 11 firms (investment banks, financial data vendors, and electronic exchanges) and elicited particular interest; CROMDI is preparing for a better financial market condition to cement a partnership. CROMDI has also recently started working with the Flying J refinery for a process control demo.

Contact Information

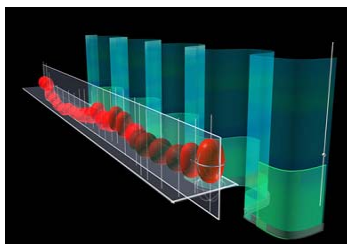
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CROMDI (MULTI-DIMENSIONAL INFORMATION)

ANESTHESIA. Anesthesiologists face unexpected incidents during 20 percent of all procedures. One quarter of these incidents represent critical events posing significant danger to patients. Therefore, quick and accurate decisions are of major importance in anesthesia. The environment is stressful and the task is difficult, because 30 or more variables need to be monitored and mentally correlated and integrated. The CROMDI team developed working prototypes that significantly reduce recognition times for detecting, diagnosing and treating anesthesia-related critical events. Testing showed a statistically significant decrease in detection time in several critical scenarios: Clinicians detected anesthesia-related critical events sooner (3.1 vs. 5.5 min). Abnormal events were diagnosed more accurately (error rate 1.1% vs. 4.1%) *Problems were corrected in one-third the time (17 sec vs. 45 sec) and drug delivery was better controlled (EC95 error 21% vs. 44%).

UNIVERSITY OF UTAH

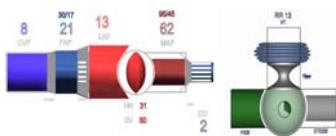
FINANCE. Investment professionals and individuals have access to a wealth of information about companies as well as real-time, historical and comparative market data. They want access to more data, but complain about too much data on their displays: this problem seems contradictory, and it can not be solved with current display technology. CROMDI developed prototypes that integrate large quantities of data in a way that will lead the user to make rapid and accurate decisions. Macro and middle level displays allow the trader to quickly view the performance of sectors and stocks in a portfolio. The micro level display allows the trader to analyze the current information on a single stock and quickly view its trend. A customer specified toolkit allows each user to determine the form of objects and select the financial variables to be displayed.



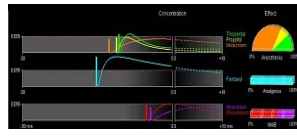
IntuInfo+Anesthesia



Traditional Anesthesia Display

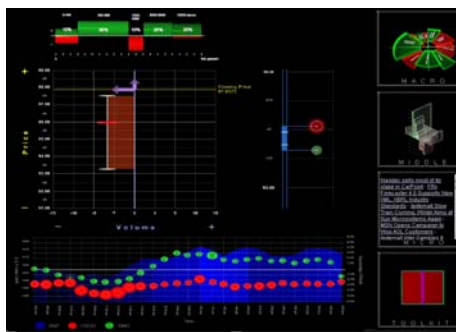


Cardiovascular and Pulmonary

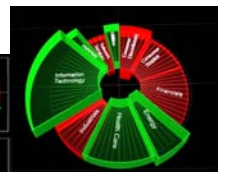


Drug Display

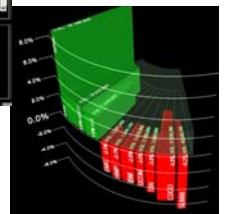
IntuInfo+Finance



Micro-View displays three objects showing the current information on a single stock.



*Macro-View
Middle-View shows the same variables*



ELECTRONIC MEDICAL EDUCATION

CENTER

The Center for Electronic Medical Education (CEME) is part of the Electronic Medical Education Resource Group (EMERG) at the University of Utah Health Sciences Center (UofU). The focus of this Center is to develop component software technology for use by physicians and scientists in image intensive fields, specifically targeted at annotation and knowledge representation. Initially, the software consisted of author tools for medical case creation and information management of image intensive data for publishing web-based clinical reference material. In fiscal year 2002, the original technology development was extended into decision support and evidenced-based medicine solutions, biomedical imaging and bioinformatics. CEME established itself as a multidimensional technology hub by extending technology development into three additional markets. Those markets are: 1) cross-media publishing and digital content distribution, 2) electronic medical records (EMR) , specifically collection of expert knowledge and annotation of visual data as part of the clinical workflow, and 3) biomedical/biotechnology imaging informatics.

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UNIVERSITY OF UTAH

ACCOMPLISHMENTS

As part of our objectives, CEME has adopted an intellectual property strategy of maximizing commercial potential by decomposing CEME technologies into as many individually licensable pieces as possible. This strategy recognizes that software applications developed for medical publishing contain intellectual property threads that can be pulled out into individual invention disclosures and woven into new combinations to meet market needs. The additional markets lead to new commercial entities that push the technology into new markets.

The following is a list of accomplishments:

A commercial spin-off, AMIRSYS, Inc., that produces electronic reference material.

A right to use license with AMIRSYS, Inc. for UofU image content.

Established the CEME as a multidimensional technology hub that addresses the needs of image integration in the electronic medical record and field of biomedical imaging informatics.

Strategic positioning of CEME technology with key industry participants that has resulted in a Memorandum of Understanding and Teaming Agreement to get CEME technology into Battlefield Telemedicine.

Patent on the core technology.

CEME technology generated multiple invention disclosures as part of a multidisciplinary collaboration and technology development effort.

ELECTRONIC MEDICAL EDUCATION

A new commercial spin-off company, Resilient Imaging, that is a services-based company for integration of annotation and knowledge representation technology.

Two SBIR grants have been submitted to the NIH National Institute for Biomedical Imaging and Bioengineering and the NIH National Cancer Institute for further development of CEME technology.

Resilient Imaging is in the process of negotiating a non-exclusive license for the CEME technology and patent with the Technology Transfer Office at the University of Utah.

TECHNOLOGY

CEME technology provides clinicians and basic scientists with knowledge representation tools built on the need to visually annotate (identify and label) images and add expert clinical knowledge (e.g., diagnosis, pathology report or clinical note) image data in the healthcare enterprise. The technology enables collaboration and sharing of results at each stage of the clinical management of a patient or clinical study, and provides a mechanism to track multiple images that are generated from multiple imaging modalities that exist in disparate file systems across the research and healthcare enterprise. CEME technology was developed in response to the critical need to capture the growing and evolving base of imaging results and expert knowledge, so that downstream experts can utilize previous results. The goal is to improve the process of scientific discoveries and healthcare by developing technology for the purposes of consistent, context-appropriate

communication and collaboration, standardization and interoperability of clinical tools and interactive presentation of data.

CEME technology solutions facilitate the incremental and collaborative collection of expert knowledge in the form of non-destructive visual annotations and text that readily make the collected information available to other experts. The following list outlines the benefits of CEME technology:

Reduces repetition of work by image re-interpretation. Gives physicians and scientists the ability to incrementally add expert knowledge. Supports multi-specialty authoring of single images. Enables sharing of images and applied expert knowledge. Reduces replication of reference images that complicates storage and retrieval. Developed technology uses visual annotations that are not embedded in the images and subsequently do not alter or destroy the image data (i.e., image pixels). Provides the ability to integrate lexicons and medical vocabularies. Structured textual information with image information. Provides a solution to link image and expert knowledge. Interactive, instructive representation of multi-specialty expert knowledge. Enables physician-physician, physician-scientist and physician-patient interaction..

MICROBE DETECTION & PHYSIOLOGY

CENTER

The focus of this center is the development of technologies that lead to the real time detection of pathogenic micro-organisms. This involves the development of novel pathogen capture molecules, platform development, prototype development, and commercialization. Industries where this technology is useful include pharmaceuticals, biomedicine, biotechnology, veterinary, production agriculture, food processing, public health, defense, and water and sewage treatment.

TECHNOLOGY

The primary focus of the Center is bacterial detection, but other targets are also investigated. To date, four technologies have been developed: ImmunoFlow, ImmunoDNA, GlycoBind, and TissueTag. Each technology has a unique use and application, but is not limited to a single type of use. For example, ImmunoFlow has many fields of use ranging from water to air, and has the potential to detect many types of bacteria. Initial prototypes are available for *Bacillus globgii* spores, *Lactobacillus*, *Salmonella* and *E. coli* O157 cells. Each type of assay has a maximum detection time of 30 minutes with a sensitivity of less than 10 cells. A unique feature of each technology is that it is volume independent; both large (tens of liters) and small (1 to 100 milliliters) samples are commonly used. Each technology is at a different stage of development, with ImmunoFlow being the most developed.

UTAH STATE UNIVERSITY

Can you imagine....

Being able to detect less than 10 cells of a harmful pathogen, such as salmonella or *E. coli*, in a quart of milk, within 30 minutes?



ACCOMPLISHMENTS

The Center has licensed the ImmunoFlow technology to Stellar Technologies, and is ready to proceed with alpha and beta testing. A new company was formed (BioMatrix Solutions) to produce and market ImmunoFlow under the name of LumiFlow. Initial marketing efforts are being directed to the food and beverage industry.

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NUCLEAR, MEDICAL AND ENVIRONMENTAL TECHNOLOGIES

CENTER

Large companies are currently downsizing, outsourcing, and eliminating risky and costly nuclear research and development (R&D) capabilities, and are teaming with universities with established nuclear engineering programs and research facilities to perform key services. An additional market trend is for companies to off-load ownership and operation of their nuclear testing, diagnostic, and irradiation facilities, and to contract with new owners for specific access and services. Others are simply decommissioning their nuclear facilities without replacement. The result is a decrease in availability of licensed facilities. That, in combination with an increasing demand for services from the private sector, provides the basis for a solid commercial opportunity. The commercial strategy of the **Center for Nuclear, Medical, and Environmental Technology (CNMET)** is to acquire selected spun-off facilities and consolidate existing niche markets into a single, well-managed and licensed entity that can provide a convenient source for a full range of nuclear services. E-Cubed and Nuclear Labyrinth will assume commercial production to reduce costs, implement uninterrupted production cycles, and achieve economies of scale. Appropriate R&D functions then will be merged and contracted to universities with nuclear facilities, such as the University of Utah's TRIGA reactor, to promote innovation, train co-operatively, and supply a steady stream of knowledgeable and seasoned potential employees to the workforce.

UNIVERSITY OF UTAH

ACCOMPLISHMENTS

CNMET has investigated market sector definition and market research studies for medical radioisotopes (seeds); neutron, gamma, and x-ray radiography; irradiation survivability of electronic components; and plutonium (Pu)-bioassays. CNMET is currently in a position to launch a new company, called "Nuclear Labyrinth LLC," and to facilitate the growth of a second business, E-Cubed Inc. These Utah-based companies will implement contracts for the use of the University of Utah's reactor. The CENTER will perform R&D activities for these companies that will result in new IP, which subsequently can be licensed through the TTO. CNMET continues to identify other underserved clients through its targeted market research.

CNMET will graduate from the state-supported Centers of Excellence (COE) program at the end of its fiscal year's funding (June 30, 2003). Beginning July 1, 2003, after only two years, CNMET plans to be financially independent, without further need for COE resources.

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NUCLEAR, MEDICAL AND ENVIRONMENTAL TECHNOLOGIES

TECHNOLOGY

A newly spawned entity, Nuclear Labyrinth LLC, along with an existing Utah business, E-cubed Inc., will offer a variety of commercial nuclear production services. Both Utah-based companies plan to contract major portions of their R&D functions to the University of Utah's Center for Excellence in Nuclear Technology, Engineering, and Research (CENTER) and license back any applicable intellectual property (IP) from the Technology Transfer Office (TTO). The CENTER will provide valuable hands-on training functions for both of its partner organizations. Combined commercial missions will improve and expand nuclear services to existing and underserved clients. Operations will be conducted, via contracts, at four locations:

- 1) Little Mountain, Utah. E-Cubed Inc.'s activities will include introducing commercial opportunities into the Survivability and Vulnerability Integration Center located at Little Mountain, Utah. E-Cubed and Hill Air Force Base (HAFB), the owner of the Little Mountain facility, will enter into an industrial partnership in 2003. E-Cubed will be performing material diagnostics for civilian work from major commercial parts manufacturers (aerospace, automotive, energy, electronic, etc.). Non-defense work is initially estimated to be at least \$1 million/year.
- 2) California. A major multinational company recently retained one of its divisions that operates a nuclear reactor in California in order to consummate a recent spin-off transaction. Due to the sensitivity of the information and current negotiations, the identity and location cannot be cited here. The parent company now wants to divest itself of the material diag-

nostic activities that use a reactor, because of burdensome regulations and perceived operational risks involved in conducting operations outside their core business. The company is willing to self-finance the reactor sale to a suitable buyer over a period of three to five years. Furthermore, transfer of reserve-fund obligations and liabilities associated with decommissioning the reactor to a buyer can be achieved on advantageous terms for the buyer. E-Cubed is ideally suited to acquire the reactor facility and to assume full operational responsibilities at the current reactor's site; to convert its technology to all-digital production format; and to add related interpretative and design services (i.e., radiation detection, dosimetry, analysis etc.) to significantly increase revenues.

- 3) Salt Lake City, Utah. Nuclear Labyrinth will operate a computational group engaged in simulating and modeling advanced radiation technologies and related processes. This group will be active in international activities supported by government and industry.
- 4) University of Utah CENTER. Nuclear Labyrinth and E-Cubed plan to contract with the CENTER at the University of Utah for various research and development projects, such as the digitization of current California radiography imaging technology, the development of rapid bioassay techniques, and to enhance computer codes. The newly developed proprietary technologies then will be licensed back to the two companies via the TTO. CNMET intends to conduct targeted market research to identify other underserved clients for both Nuclear Labyrinth and E-Cubed.

PETROLEUM RESEARCH

CENTER

The mission of the Petroleum Research Center (PERC) at the University of Utah is to conduct research and development studies leading to practical, cost-effective solutions to liquid hydrocarbon production, handling and transportation. With funding from the U.S. Department of Energy and the petroleum industry, the PERC coordinates basic and applied research in: the physical properties and physical and chemical thermodynamics of naturally occurring hydrocarbons, development of pipeline transportation and flow assurance strategies, and simulation, optimization and control of oil and gas recovery methods.

TECHNOLOGY

The Petroleum Research Center (PERC) was funded to commercialize and market two specific areas of work: understanding problems related to the production, transportation and processing of waxy and asphaltenic crude oils and the subsequent alleviation of these problems and developing a variety of methods and software tools (models) for the efficient and optimal production of oil and gas from underground reservoirs. Over the last several years, oil companies and federal agencies have funded (and continue to fund) research in PERC, which is an integral part of the Department of Chemical and Fuels Engineering at the University of Utah.

UNIVERSITY OF UTAH

Can you imagine....

A variety of methods and software tools for the efficient and optimal production of oil and gas from underground reservoirs?



ACCOMPLISHMENTS

Schlumberger and Halliburton donated software worth about \$10 million, making the Center the premier state of the art oil reservoir simulation facility. Alyeska Pipeline Service Company employed a professional with a Ph. D. in Salt Lake City to monitor technology development at the Center. Universal Oil Products and Flying J conducted a project to test the performance of one of their new process units at the Center.

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RAPID PROTOTYPING

CENTER

The Center for Rapid Prototyping is focused in the areas of ultrasonic sensing of injection molding, and physical and virtual geometric modeling for computer aided design.

TECHNOLOGY

This Center is focusing on several projects which include machining techniques to include a method for making Powder metal parts, a low cost software allowing the production of prototype parts on a 2 or 3 axis computer controlled router or mill, and machining of molds for micro-injection molding. Examples of products include:

- *A series of new sensors and control techniques for improved polymer processing
- *A new Personal Prototyping System (PPS) that makes rapid prototyping available to small companies and perhaps the private consumer.
- *A low cost 3D scanning system that, used in conjunction with the PPS becomes a 3D fax machine.
- *A device that is capable of building very large prototypes (Shapemaker).
- *A photopolymer based technique to create prototypes in a single step (Inverse Tomographic Construction or ITC).

UNIVERSITY OF UTAH

Can you imagine.....

A personal prototyping system that develops and creates prototypes at a very low cost on your own inkjet or laserjet printer???



ACCOMPLISHMENTS

In the first year of funding, several milestones were met including the completed commercial RapidPro software, proof of principle demonstration of the Personal Prototyping System, a demonstration of the Ultrasound sensor to a local company, and a completed calibration demonstration for the 3D scanner.

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SMART SENSORS

CENTER

Smart Sensors probe the environment and modify their function in order to improve their data gathering capability. A smart sensor adapts to its environment, and sends improved data to the main processing computer. A smart sensor melds sensor, signal processing, and computer technologies. Applications span medicine, precision agriculture, electronics manufacturing, wireless communication, transportation and radar.

TECHNOLOGY

The Center for Smart Sensors focuses on two core technologies that have the greatest commercial potential, and five support technologies that are key aspects of the Center and enable the development and implementation of products utilizing the core technologies. This year we have added to the methods available for our core technologies, and are actively seeking license agreements in each of our core technology areas. Additional patents and invention disclosures have been filed in both core areas this year. Both families of technologies are based on simple ideas and simple circuits that result in two critical advantages -- **Small and Cheap**. This makes them applicable to a wide array of applications.

UTAH STATE UNIVERSITY

Can you imagine.....



An early warning system for computer disk drive failure, a preflight test system for aging aircraft wiring, and a system to protect military personnel from being overrun by tanks?

ACCOMPLISHMENTS

A lot of recent media attention has occurred surrounding the Center's smart wiring devices. This is driving potential partners and buyer agencies to demand our technology earlier than expected, and we may be able to sell a prototype design soon. We have begun to systematically dissect the technologies that may compete with our imbedded antenna technology to look for applications that could benefit from smaller and cheaper smart sensors.

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VASCULAR BIOTHERAPEUTICS

CENTER

The Center for Vascular Biotherapeutics is focused on commercializing medical strategies and devices that target blood vessel formation for the treatment of cancer and obstructive vascular diseases such as atherosclerosis. This Center capitalizes on a robust scientific program aimed at deciphering the molecular blueprint for vessel regeneration using human genetics and transgenic mice technologies; these technologies were pioneered at the University of Utah. The "Functional Vascular Genetics" program established at the University of Utah is identifying genes that are essential for vascular development. This program has significantly contributed to the understanding of how blood vessels are formed, and produced publications in the most prestigious scientific journals (e.g. *Nature*, *Science*, *Nature Genetics*, *Journal of Clinical Investigation*, *American Journal of Physiology*).

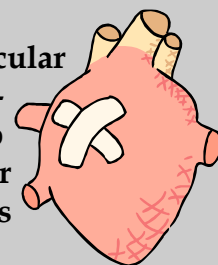
ACCOMPLISHMENTS

In the first year, the Center has met all three of its critical commercialization objectives: testing therapeutics in pre-clinical trials, licensing its intellectual property to private industry, and spinning off a biotechnology company.

UNIVERSITY OF UTAH

Can you imagine.....

Deciphering the molecular blueprint for vessel regeneration, in order to treat cancer and other vascular diseases such as atherosclerosis?



TECHNOLOGY

There are two major thrusts of the program. The first involves understanding the role of the matrix protein elastin in regulating vascular smooth muscle cell proliferation, migration and differentiation. The second is to identify novel molecular pathways involved in angiogenesis. The purpose of the center is to commercialize the scientific discoveries of the program.

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